REMARKS

By this amendment, claims 1, 2, and 5 – 11, are pending in the application, claims 12-28 are withdrawn from consideration as drawn to a non-elected invention, claim 1 is being amended, and claims 3 and 4 are being cancelled.

Claim 1 is being amended to include the language "by at least one of (i) immersing the surface in a fluid, and (ii) spraying the surface with the fluid" which was present in original claim 16.

The claim amendments and added claims are fully supported by the originally filed specification and original claims and add no new matter.

Restriction/Election Under 35 U.S.C. § 121

The Examiner restricted the application to one of the following groups: Group I, Claims 1-11; Group II, Claims 12-20; or Group III, Claims 21-22 [sic 28]. Applicant believes that the Office Action mistyped the claims of Group III, as the application as filed had 28 claims; whereas only 22 claims were listed in the restriction requirement.

Applicant elects the claims of Group I, as defined by the Examiner, namely, claims 1-11, without traverse.

Traverse is on grounds that the claims of Group III, as defined by the Examiner, should be examined along with the claims of Group I. This is because the claims of Group III, include claim 21 which has the step of "immersing the surface comprising the process deposits in a bath comprising liquid nitrogen to form fractures in the process deposits." This step is the same step as that claimed in claim 4 which depends on claim 1. Consequently, the Examiner will have to search for liquid nitrogen cooling, which search was already performed in the present Office Action, to examine

claim 4. Thus, it imposes little burden on the Patent Office to examine the claims of Group III along with the claims of Group I. Thus, Applicant requests withdrawal of the restriction of Group III and incorporation of the claims of Group III into Group I for examination herein.

Objection to Drawings

The Specification is being amended to reference Figure 3 in the objected-to paragraph at page 6, lines 3-15, which shows the missing reference numerals listed by the Examiner in the Objection to the Drawings.

Rejection of Claims 1, 2, and 9, under 35 USC 102 (b)

The Office Action rejected to claims 1, 2, and 9, under 35 USC 102 (b) as being anticipated by Sasaki (6,214,130).

As amended, claim 1 is to a method of cleaning a surface of a substrate processing chamber component to remove process deposits, comprising cooling the surface comprising the process deposits to a temperature below about -40°C by at least one of (i) immersing the surface in a fluid, and (ii) spraying the surface with the fluid, thereby fracturing the process deposits on the surface.

Sasaki does not teach cooling the surface of the component comprising the process deposits to a temperature below about -40°C by at least one of (i) immersing the surface in a fluid, and (ii) spraying the surface with the fluid, as claimed in amended claim 1. Specifically, Sasaki does not teach immersing the surface of the component in a fluid. Also, Sasaki does not teach spraying the surface of the component with a fluid. Instead, Sasaki teaches supplying liquid nitrogen from one end of a pipe into the inside of the pipe to cause the nitrogen <u>to absorb heat from the pipe or the outside of the pipe so that the liquid nitrogen is vaporized</u> and therefore becomes a

nitrogen gas. Applying a gas to the inside of a component is not the same process step as immersing a component in a fluid or spraying the component with fluid.

Sasaki teaches:

> One example of the method for cleaning up the inside of the pipe by use of N_2, is disclosed in Japanese Patent Application Pre-examination Publication No. JP-A-04-145991 (an English abstract of JP-A-04-145991 is available and the content of the English abstract is incorporated by reference in its entirety into this application). In this prior art method, the inside of the pipe is cleaned up by alternately repeating a supplying of a liquid nitrogen into the pipe and a gas purging for the pipe.
>
> The liquid nitrogen supplied from one end of the pipe into the inside of the pipe absorbs heat from the pipe or the outside of the pipe so that the liquid nitrogen is vaporized and therefore becomes a nitrogen gas. In this process, because of a cooling effect by the temperature of the liquid nitrogen itself having a boiling temperature of -197° C. and because of a boiling of the liquid nitrogen, contaminant adhered to the inside of the pipe is peeled off and removed away. In the case of an organic micro-contaminant, the cooling effect causes the organic contaminant to contract so that an adhering force of the organic contaminant drops because of a difference in thermal expansion coefficient between the organic contaminant and a material of the pipe. On the other hand, the boiling of the liquid nitrogen peels off the organic contaminant adhered to the inside of the pipe by its physical action.
>
> However, this prior art method for cleaning up the inside of the pipe, was insufficient in removing the organic matters, as mentioned hereinbefore. In addition, the boiling of the liquid nitrogen within the pipe is dangerous because a high pressure suddenly acts within the pipe.

Thus, Sasaki teaches applying nitrogen gas to the pipe and does not teach immersing a component in a fluid or spraying a component with a fluid. Specifically, Sasaki teaches that liquid nitrogen boils as it absorbs heat to become a gas causes the contaminant adhered to the inside of the pipe to be blown off and removed away. In other words, the violent boiling action of the vaporized gas blows off the contaminant residues from the sidewalls of the tube while they are subject to thermal

stresses. In contrast, the present process comprises the step of immersion of the component in the fluid, or spraying of fluid onto the surface to the component, to cause the component surface to reach low temperatures of - 40°C which cause the residue material to flake off from the component surface without the violent blowing-off action of the nitrogen gas as described by Sasaki. Applying a fluid by immersion or spraying is a different process step than applying a gas to a component.

Thus Sasaki does not anticipate under Section 102(b) the present claims because Sasaki does not teach the step of immersing a component in a fluid or spraying a component with a fluid, as claimed.

Rejections under 35 USC 103 (a)

1. The Office Action rejected claims 3-4, 6 and 10 under 35 USC 103 (a) as unpatentable over Sasaki in view of Braton (3,934,379) et al.

Applicant respectfully submits that the Office Action has failed to establish a prima facie obviousness rejection of claims 3-4, 6 and 10 based on the cited combination of Sasaki and Braton et al.. To establish a *prima facie* obviousness rejection under 35 U.S.C. 103(a), there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the teachings of the different references. Second, there must also be a reasonable expectation of success for such a combination. Furthermore, the prior art references that are combined must teach or suggest all the claim limitations. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Claims 3, 4 and 10 are all dependent on claim 1. As explained above, Sasaki does not teach a method of cleaning a surface of a component to remove process deposits, comprising cooling the surface of the component comprising the process deposits to a temperature below about -40°C by at least one of (i) immersing

the surface in a fluid, and (ii) spraying the surface with the fluid, thereby fracturing the process deposits on the surface, as claimed in claim 1.

More specifically, Sasaki does not teach immersing the surface of the component in a fluid or spraying the surface of the component with a fluid as claimed. Instead, Sasaki teaches applying nitrogen gas into the inside of the pipe to cause the contaminant adhered to the inside of the pipe to peel off. The nitrogen gas blows off the contaminant residues from the pipe sidewalls while they are subject to thermal stresses. In contrast, the present process comprises the steps of immersion of the component in the fluid, or spraying a fluid onto the surface to the component, to cause the component surface to reach low temperatures of - 40°C, which cause the residue material to fracture and flake off from the component surface without the violent blowing-off action of nitrogen gas as described by Sasaki. Thus, Sasaki teaches applying nitrogen gas to the pipe and does not teach immersing a component in a fluid or spraying a component with a fluid to reach low temperatures of - 40°C.

Furthermore, Sasaki teaches against application of vaporized liquid nitrogen to a component. Sasaki teaches that application of vaporized liquid nitrogen gas was insufficient in removing all of the organic matters. Sasaki also teaches that the sudden increase in gas pressure inside the pipe caused by application of the nitrogen gas in the pipe is dangerous. Thus, one of ordinary skill in the art would not have a reasonable expectation of success based on the teachings of Sasaki of the nitrogen gas method, and moreover, the described method is substantially different from the claimed method of immersion or spraying a component with a fluid, as it applies a gas to the component.

Braton et al. does not make up for the deficiencies of Sasaki. First, Braton is non-analogous art because Braton et al. is to an industrial process to remove organic residues that build up in the application of surface finishes or surface treatments to parts. (Col. 1, lines 11-25.) In contrast, the present claims are to a substrate cleaning process performed in the art of semiconductor fabrication. While the Braton et al.

process is a dirty industrial process performed on a factory floor, the process of claim 1 is typically performed in an ultra clean fabrication laboratory during fabrication of semiconductors and displays. One of ordinary skill would not seek knowledge from conventional heavy industry coating processes to apply to semiconductor and display fabrication processes. Thus Braton et al. should not be applied in this rejection as the reference is non-analogous art.

Furthermore, for such a combination there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the teachings of the different references. There is no suggestion in Braton et al. to apply the process described to remove process residues to processes for cleaning components in semiconductor fabrication. Similarly, there is not suggestion in Sasaki to apply its described gas cleaning processes to the industrial arts described by Braton et al.

For these reasons, Applicant respectfully submits that the Office Action has failed to establish a prima facie obviousness rejection of claims 3-4, 6 and 10, based on the cited combination of Sasaki and Braton et al.. Accordingly, Applicant respectfully requests withdrawal of the rejection and allowance of the present claims.

2. The Examiner rejected claim 5 under 35 USC 103 (a) as being unpatentable over Sasaki in view of Barton et al. as applied to claim 1, and further in view of Sakurai et al. (6,082,373).

Applicant respectfully submits that the Office Action has failed to establish a prima facie obviousness rejection of claim 5 based on the cited combination of Sasaki, Braton et al. and Sakurai et al..

Claim 5 is also dependent on claim 1. As explained above, Sasaki does not teach a method of cleaning a surface of a component to remove process deposits, comprising cooling the surface of the component to a temperature below about -40°C by

immersing the surface in a fluid or spraying the surface with the fluid, as claimed in claim 1. In the claimed process, application of a cooling fluid to the component causes fracturing of the process deposits on the component surface.

Sasaki teaches a different process in which nitrogen gas is applied into a pipe so that the nitrogen gas blows off the contaminant residues from the pipe sidewalls while they are subject to thermal stresses. Sasaki teaches against application of a liquid to a component because Sasaki teaches that application of liquid nitrogen was insufficient in removing all of the organic matters, and that a sudden increase in pressure of the nitrogen gas causing by volatilization of the liquid nitrogen within the pipe to form gaseous nitrogen is dangerous. Braton et al. does not make up for the deficiencies of Sasaki because Braton et al. is non-analogous art which is to an industrial process to remove organic residues that build up in the application of surface finishes or surface treatments to parts.

Sakurai et al. does not make up for the deficiencies of Sasaki or Barton et al. because Sakurai et al. also does not teach application of a fluid to a component by immersion or spraying to cool the component to reach low temperatures of - 40°C, thereby fracturing process deposits on the component surface as claimed. Instead Sakurai et al. teaches a cleaning process in which oxygen is dissolved in aerated water and the component is contacted with the water while ultrasonic vibrations are applied. (Abstract.) Sakurai et al. further teaches that:

> It is preferred that the amount of oxygen dissolved into the pure water is 0.5 ppm or more. According to the oxygen dissolving methods (1) and (2), oxygen can be dissolved into pure water up to about 20 ppm at 25° C.

(Col. 3, lines 16-19.) Thus, Sakurai et al. teaches a cleaning process in which the component is maintained at temperatures of 25°C in aerated water. Sakurai et al. does not teach the claimed process of immersing a component in the fluid or spraying a fluid onto the component to cool the component surface to low temperatures of -40°C.

Thus, Sasaki teaches applying nitrogen gas into a pipe so that the nitrogen gas blows off the contaminant residues and teaches against application of a liquid to a component. Braton et al. is non-analogous art because Braton et al. is to an industrial process to remove organic residues that build up in the application of surface finishes or surface treatments to parts. Sakurai et al. teaches a cleaning process in which the component is maintained at temperatures of 25°C in aerated water. Thus, one of ordinary skill in the art would not have a reasonable expectation of success, or motivation, to employ the process taught by Sasaki, Barton et al., or Sakurai et al. to derive the claimed process of immersing a component in the fluid or spraying of a fluid onto a component, to cool the component surface to low temperatures of -40°C, thereby causing residue material to fracture and flake off from the component surface.

Thus, Applicant respectfully submits that the Office Action has failed to establish a prima facie obviousness rejection of claim 5 based on the cited combination of Sasaki, Barton et al., and Sakurai et. al.. Accordingly, Applicant respectfully requests withdrawal of the rejection and allowance of the present claims.

3. The Examiner further rejected claims 6, 7-8 under 35 USC 103 (a) as being unpatentable over Sasaki in view of Klee et al. (4,627,197)

Applicant respectfully submits that the Office Action has failed to establish a prima facie obviousness rejection of claims 6-8 based on the cited combination of Sasaki and Klee et al..

Claims 6 and 7-8 are all dependent on claim 1. As explained above, Sasaki does not teach a method of cleaning a surface of a component to remove process deposits, comprising cooling the surface of the component to a temperature below about -40°C by immersing the surface in a fluid or spraying the surface with the fluid, as claimed in claim 1.

Sasaki teaches applying nitrogen gas into a pipe so that the nitrogen gas blows off the contaminant residues from the pipe sidewalls while they are subject to thermal stresses. In contrast, the present process comprises the steps of immersion of the component in the fluid, or spraying of a fluid coolant onto the surface to the component, to cause the component surface to reach low temperatures of -40°C, which cause the residue material to fracture and flake off from the component surface without the blowing-off action of nitrogen gas. Thus, Sasaki teaches applying nitrogen gas to the pipe and does not teach immersing a component in a fluid or spraying a component with a fluid to reach low temperatures of - 40°C. In fact, Sasaki teaches against application of a liquid to a component because Sasaki teaches that the nitrogen gas method was insufficient in removing all of the organic matters; and also that the sudden increase in pressure of the nitrogen gas within the pipe is dangerous. Thus, one of ordinary skill in the art would not have a reasonable expectation of success based on the teachings of Sasaki.

Klee et al. does not make up for the deficiencies of Sasaki because Klee et al. is also non-analogous art. Klee et al. teaches the non-analogous art of removing flash from molded articles and paint and other coatings. (Col. 1, lines 10-15.) Removing flash molding is also an industrial process performed in a dirty environment. In contrast, the present claims are a substrate cleaning process performed in the art of semiconductor fabrication. The process of claim 1 is typically performed in an ultra clean fabrication lab to form semiconductors and displays. The process of Keel et al. is performed on a factory floor. One of ordinary skill would not seek knowledge from conventional factory processes to apply to semiconductor and display fabrication processes. Thus Klee et al. should not be applied in this rejection as Klee et al. is non-analogous art.

Furthermore, for such a combination there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the teachings of the different references. There is no suggestion in Klee et al. to apply the process described to remove process

residues in semiconductor fabrication. Similarly, there is not suggestion in Sasaki to apply its described processes to the industrial arts described by Klee et al.

For these reasons, Applicant respectfully submits that the Office Action has failed to establish a prima facie obviousness rejection of claims 6-8 based on the cited combination of Sasaki and Klee et al.. Accordingly, Applicant respectfully requests withdrawal of the rejection and allowance of the present claims.

4. The Examiner rejected claim 11 under 35 USC 103 (a) as being unpatentable over Sasaki in view of Hatano (5,954,887).

Applicant respectfully submits that the Office Action has failed to establish a prima facie obviousness rejection of claim 11 based on the cited combination of Sasaki and Hatona. Claim 11 is also dependent on claim 1. As explained above, Sasaki does not teach a method of cleaning a surface of a component to remove process deposits, comprising cooling the surface of the component to a temperature below about -40°C by immersing the surface in a fluid or spraying the surface with the fluid, as claimed in claim 1.

In the present process, application of a cooling fluid to the component causes fracturing of the process deposits on the component surface. Sasaki teaches applying nitrogen gas into a pipe to blow off the contaminant residues from the pipe sidewalls. Sasaki also teaches against application of a liquid to a component because Sasaki teaches that application of liquid nitrogen was insufficient in removing all of the organic matters, and more importantly, the sudden increase in pressure of the nitrogen gas causing by volatilization of the liquid nitrogen within the pipe to form gaseous nitrogen is dangerous. Thus, one of ordinary skill in the art would not have a reasonable expectation of success to employ the process taught by Sasaki. Furthermore, in contrast to the teachings of Sasaki, the present process comprises the steps of immersion of the component in the fluid, or spraying of a fluid coolant onto the surface to the component, to cause the component surface to cool to reach low

temperatures of - 40°C. This causes the residue material to fracture and flake off from the component surface without the violent blowing-off action of nitrogen gas vaporized from liquid nitrogen. Thus, Sasaki teaches against applying liquid nitrogen to the inside of a pipe and also does not teach immersing a component in a fluid or spraying a component with a fluid to reach low temperatures of - 40°C as claimed.

Hatono does not make up for the deficiencies of Sasaki because Hatona also does not teach application of a fluid to a component by immersion or spraying to cool the component to reach low temperatures of - 40°C, thereby fracturing process deposits on the component surface as claimed. Instead Hatona teaches a cleaning process in which a Ti film is cleaning inside a plasma chamber by stopping the flow of H_2 gas and Ar gas while continuing the flow of $TiCl_4$ gas and other gases and maintaining the chamber at temperatures of 650° C. Hatona teaches:

> Next comes a cleaning processing step according to the present embodiment, as indicated by a period T12 in FIG. 2.
>
> . . .
>
> Thereafter, with the supply of the Ar gas and H_2 gas stopped, the $TiCl_4$ gas as a material gas and an inactive gas, e.g., an N_2 gas as a carrier gas which helps supply of the $TiCl_4$ gas are introduced into the chamber.
>
> No high frequency wave is supplied from the high frequency power source, and cleaning processing is carried out under a plasmaless condition. Therefore, a mixture gas of only the $TiCl_4$ gas and the N_2 gas is supplied under a plasamaless condition.
>
> The cleaning processing is carried out while the temperature of the susceptor 16, i.e., the temperature in the process chamber 4 is maintained at the same temperature as that when forming a Ti film during the period T11, e.g., 650° C.

(Col. 5, lines 62-63 and col. 6, lines 4-17.) Thus, Hatona teaches a cleaning process in which the component is maintained at temperatures of 650°C while a gas is supplied to a chamber. Hatona does not teach the claimed process of immersing a component in the fluid or spraying a fluid onto the component to cool the component surface to low temperatures of -40°C, thereby causing residue material to fracture and flake off from the component surface.

Thus, Sasaki teaches applying nitrogen gas into a pipe so that the nitrogen gas blows off the contaminant residues from the pipe sidewalls while they are subject to thermal stresses. Sasaki also teaches against application of a liquid to a component because Sasaki teaches that application of liquid nitrogen was insufficient and the sudden increase in pressure of the nitrogen gas is dangerous. Hatona teaches a cleaning process in which the component is maintained at temperatures of 650°C while a gas is supplied to a chamber. Thus, one of ordinary skill in the art would not have a reasonable expectation of success to employ the process taught by Sasaki or Hatona to derive the claimed process of immersing a component in the fluid or spraying of a fluid onto the surface to the component, to cool the component surface to low temperatures of -40°C, thereby causing residue material to fracture and flake off from the component surface.

For these reasons, Applicant respectfully submits that the Office Action has failed to establish a prima facie obviousness rejection of claim 11 based on the cited combination of Sasaki and Hatona. Accordingly, Applicant respectfully requests withdrawal of the rejection and allowance of the present claims.

The above-discussed amendments are believed to place the present application in condition for allowance. Should the Examiner have any questions regarding the above remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,

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Date: April 24th, 2006

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